PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): HALEK ET AL.	Attorney Docket No.: E21-006-01-US
Application No.: 10/619,011	Group Art Unit: 2828
Filed: JULY 14, 2003	Examiner: M. C. WIMER
Title: MICROWAVE DEMULSIFICATION OF HYDROCARBON EMULSION	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

Dear Sir or Madam:

In response to the Office Action dated February 2, 2006, Applicant submits the following Amendment and Remarks.

Please amend the above-identified application as follows:

Amendments to the claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 13 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Withdrawn) A radio frequency (RF) applicator comprising an antenna body having a longitudinal axis and an outer surface defining a plurality of slots substantially parallel to one another and substantially perpendicular to the longitudinal axis.

2. (Withdrawn) The RF applicator of claim 1, wherein the antenna body is tapered along the longitudinal axis.

3. (Withdrawn) The RF applicator of claim 1, wherein:

the antenna body has a length; and

the outer surface defines the plurality of slots along substantially the entire length of the antenna body.

4. (Withdrawn) The RF applicator of claim 1, wherein the antenna body comprises a plurality of faces forming a quadrilateral cross-section.

5. (Withdrawn) The RF applicator of claim 4, wherein the slots are defined by each of two parallel faces.

6. (Withdrawn) The RF applicator of claim 4, wherein the plurality of faces form a rectangular cross-section.

7. (Withdrawn) The RF applicator of claim 1, wherein the antenna body comprises two walls formed from an RF opaque material.

8. (Withdrawn) The RF applicator of claim 1, wherein the walls are formed from aluminum.

9. (Withdrawn) The RF applicator of claim 1, wherein the antenna body is formed from aluminum.

10. (Withdrawn) The RF applicator of claim 1, further comprising:

an RF transparent window arrangement disposed proximate the outer surface of the antenna body and arranged to cover the plurality of slots; and

an antenna enclosure formed proximate the antenna body to substantially seal the antenna body from an environment external to the RF applicator.

11. (Withdrawn) The RF applicator of claim 10, wherein the RF transparent window arrangement comprises a plurality of RF transparent windows formed from a material having a low dielectric constant.

12. (Withdrawn) The RF applicator of claim 11, wherein the RF transparent windows are formed from a material selected from the group consisting of fiberglass and TEFLON® polytetrafluoroethylene.

13. (Withdrawn) The RF applicator of claim 10, wherein the antenna enclosure is formed from a material having a low dielectric constant.

14. (Withdrawn) The RF applicator of claim 13, wherein the antenna enclosure is formed from a material having a similar dielectric constant relative to a

material forming the RF transparent window arrangement.

15. (Withdrawn) The RF applicator of claim 13, wherein the antenna enclosure is formed from fiberglass.

16. (Withdrawn) The RF applicator of claim 1, wherein:

the antenna body comprises first and second ends; and

a waveguide is coupled to the first end of the antenna body.

17. (Withdrawn) The RF applicator of claim 16, further comprising a cap coupled to the second end of the antenna body.

18. (Withdrawn) The RF applicator of claim 17, wherein the cap is arranged to reflect an RF signal propagated within the antenna body to generate constructive interference.

19. (Withdrawn) The RF applicator of claim 16, wherein the cap is formed from aluminum.

20. (Currently amended) A demulsification arrangement to remove a microwave-absorptive material from a substrate, the demulsification arrangement comprising:

a containment structure defining a treatment volume and adaptable to receive an emulsion comprising the microwave-absorptive material and the substrate;

a power source; and

a radio frequency (RF) applicator operatively coupled to the power source and positioned within the containment structure to deliver microwave energy into the treatment volume, the RF applicator comprising an antenna body having a longitudinal axis and an outer surface defining a plurality of slots substantially parallel to one another and substantially perpendicular to the longitudinal axis and arranged so as to radiate the microwave energy over substantially less than a 360° arc outward from the RF applicator;

whereby, when the containment structure contains the emulsion and the applicator delivers the microwave energy into the treatment volume, the microwave-absorptive material and the substrate are demulsified.

21. (Original) The demulsification arrangement of claim 20, wherein the antenna body is tapered along the longitudinal axis.

22. (Original) The demulsification arrangement of claim 20, wherein:

the antenna body has a length; and

the outer surface defines the plurality of slots along substantially the entire length of the antenna body.

23. (Original) The demulsification arrangement of claim 20, wherein the antenna body comprises a plurality of faces forming a rectangular cross-section.

24. (Original) The demulsification arrangement of claim 23, wherein the slots are defined by each of two parallel faces.

25. (Original) The demulsification arrangement of claim 20, wherein the

antenna body comprises two walls formed from an RF opaque material.

26. (Original) The demulsification arrangement of claim 25, wherein the walls are formed from aluminum.

27. (Original) The demulsification arrangement of claim 20, wherein the antenna body is formed from aluminum.

28. (Original) The demulsification arrangement of claim 20, wherein the RF applicator further comprises:

an RF transparent window arrangement disposed proximate the outer surface of the antenna body and arranged to cover the plurality of slots; and

an antenna enclosure formed proximate the antenna body to substantially seal the antenna body from an environment external to the RF applicator.

29. (Original) The demulsification arrangement of claim 28, wherein the RF transparent window arrangement comprises a plurality of RF transparent windows formed from a material having a low dielectric constant.

30. (Original) The demulsification arrangement of claim 29, wherein the RF transparent windows are formed from a material selected from the group consisting of fiberglass and TEFLON® polytetrafluoroethylene.

31. (Original) The demulsification arrangement of claim 28, wherein the antenna enclosure is formed from a material having a low dielectric constant.

32. (Original) The demulsification arrangement of claim 31, wherein the antenna enclosure is formed from a material having a similar dielectric constant relative to a material forming the RF transparent window arrangement.

33. (Original) The demulsification arrangement of claim 31, wherein the antenna enclosure is formed from fiberglass.

34. (Original) The demulsification arrangement of claim 20, wherein:

the antenna body comprises first and second ends; and

a waveguide is coupled to the first end of the antenna body.

35. (Original) The demulsification arrangement of claim 34, wherein the RF applicator further comprises a cap coupled to the second end of the antenna body.

36. (Original) The demulsification arrangement of claim 35, wherein the cap is arranged to reflect an RF signal propagated within the antenna body to generate constructive interference.

37. (Original) The demulsification arrangement of claim 35, wherein the cap is formed from aluminum.

38. (Previously presented) The demulsification arrangement of claim 20, further comprising an RF generator operatively coupled to the antenna body and to the power source and configured to generate the microwave energy.

39. (Original) The demulsification arrangement of claim 38, further comprising a control arrangement operatively coupled to the RF generator.

40. (Original) The demulsification arrangement of claim 20, further comprising an outlet port formed on the container.

41. (Original) The demulsification arrangement of claim 20, wherein the microwave-absorptive material comprises a hydrocarbon.

42. (Original) The demulsification arrangement of claim 20, wherein the substrate comprises water.

43. (Currently amended) A demulsification arrangement comprising:

a power source;

a radio frequency (RF) generator operatively coupled to the power source and configured to generate an RF signal;

a control arrangement configured to be operatively coupled to the RF generator to control generation of the RF signal; and

a radio frequency (RF) applicator configured to be operatively coupled to the RF generator, the RF applicator being positioned within a treatment volume containing an emulsion comprising a microwave-absorptive material and a substrate to transmit the RF signal, the RF applicator comprising an antenna body having a longitudinal axis and an outer surface defining a plurality of slots substantially parallel to one another and substantially perpendicular to the longitudinal axis and arranged so as to radiate the microwave energy over substantially less than a 360° arc outward from the RF applicator;

whereby, when the control arrangement, the RF applicator, and the RF generator are operatively coupled and the RF applicator transmits the RF signal into the treatment volume, the microwave-absorptive material and the substrate are demulsified.

44. (Original) The demulsification arrangement of claim 43, wherein the antenna body is tapered along the longitudinal axis.

45. (Original) The demulsification arrangement of claim 43, wherein:

the antenna body has a length; and

the outer surface defines the plurality of slots along substantially the entire length of the antenna body.

46. (Original) The demulsification arrangement of claim 43, wherein the antenna body comprises a plurality of faces forming a rectangular cross-section.

47. (Original) The demulsification arrangement of claim 46, wherein the slots are defined by each of two parallel faces.

48. (Original) The demulsification arrangement of claim 43, wherein the antenna body comprises two walls formed from an RF opaque material.

49. (Original) The demulsification arrangement of claim 48, wherein the walls are formed from aluminum.

50. (Original) The demulsification arrangement of claim 43, wherein the

antenna body is formed from aluminum.

51. (Original) The demulsification arrangement of claim 43, wherein the RF applicator further comprises:

an RF transparent window arrangement disposed proximate the outer surface of the antenna body and arranged to cover the plurality of slots; and

an antenna enclosure formed proximate the antenna body to substantially seal the antenna body from an environment external to the RF applicator.

52. (Original) The demulsification arrangement of claim 51, wherein the RF transparent window arrangement comprises a plurality of RF transparent windows formed from a material having a low dielectric constant.

53. (Original) The demulsification arrangement of claim 52, wherein the RF transparent windows are formed from a material selected from the group consisting of fiberglass and TEFLON® polytetrafluoroethylene.

54. (Original) The demulsification arrangement of claim 51, wherein the antenna enclosure is formed from a material having a low dielectric constant.

55. (Original) The demulsification arrangement of claim 54, wherein the antenna enclosure is formed from a material having a similar dielectric constant relative to a material forming the RF transparent window arrangement.

56. (Original) The demulsification arrangement of claim 54, wherein the antenna enclosure is formed from fiberglass.

57. (Original) The demulsification arrangement of claim 43, wherein:

the antenna body comprises first and second ends; and

a waveguide is coupled to the first end of the antenna body.

58. (Original) The demulsification arrangement of claim 57, wherein the RF applicator further comprises a cap coupled to the second end of the antenna body.

59. (Original) The demulsification arrangement of claim 58, wherein the cap is arranged to reflect an RF signal propagated within the antenna body to generate constructive interference.

60. (Original) The demulsification arrangement of claim 59, wherein the cap is formed from aluminum.

61. (Original) The demulsification arrangement of claim 43, wherein the microwave-absorptive material comprises a hydrocarbon.

62. (Original) The demulsification arrangement of claim 43, wherein the substrate comprises water.

63. (Original) The demulsification arrangement of claim 43, wherein the treatment volume comprises one of an underground treatment volume and an above-ground contained treatment volume.

64. (Original) The demulsification arrangement of claim 63, wherein the above-ground contained treatment volume comprises a container to receive the emulsion, the container having at least one outlet port defined by a wall of the container.

REMARKS

Claims 20 and 43 are amended in this paper. Accordingly, claims 20-64 are now pending.

Claim Rejections Under 35 U.S.C. § 103

Claims 20-64 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,914,014 to *Kartchner* [hereinafter *Kartchner*] in view of U.S. Patent No. 6,583.394 to *Araya et al.* [hereinafter *Araya et al.*]. This rejection is understood to be based on the premise that regarding claims 20 and 43, *Kartchner* discloses a demulsification arrangement to remove microwave-absorptive material from a substrate comprising a containment structure and an RF applicator delivered from the power source operatively coupled and positioned within the containment structure and comprising an antenna body defined as a waveguide. *Araya et al.* is cited as resolving the level of ordinary skill in the art and as evidence of obviousness and is asserted to teach, in Figure 4, a waveguide antenna applicator defined as slotted waveguides 12a arranged with slots perpendicular to the axis. The rejection is further understood to be based on the premise that it would have been obvious to employ such a waveguide in lieu of the cylindrical waveguide in *Kartchner*.

Applicant traverses the rejection. Claims 20 and 43 have been amended to recite that the slots are arranged so as to radiate the microwave energy over substantially less than a 360° arc outward from the RF applicator. For example, while claims 20 and 43 are not so limited, paragraph [0045] of the specification in the instant application discloses that in one particular implementation, "the slots 60 facilitate radiation of microwave energy over approximately a 135° arc outward from each group of slots 60, i.e., from each of the two parallel faces having slots formed thereon. Accordingly, the microwave energy applicator 50 radiates microwave energy over an approximately 270° range. Limiting the radiation to this range substantially eliminates destructive interference between the microwaves, resulting in a relatively uniform radiation pattern over the approximately 270° range."

By contrast, neither *Kartchner* nor *Araya et al.* discloses limiting the radiation

pattern of the energy applicator in this manner. Indeed, *Araya et al.* states at column 7, lines 11-19, that

> [t]he waveguide arrangements of FIGS. 3 and 4 do not provide the uniformity of microwave power distribution required to minimize ceramic piece distortion and/or cracking at the microwave input power levels necessary for the effective firing of ceramic products such as thin-walled ceramic honeycomb structures. FIG. 5 of the drawings, on the other hand, shows a waveguide configuration of the present invention that does provide the necessary uniformity.

This lack of uniformity of microwave power distribution is addressed in the embodiment recited in claims 20 and 43 by limiting the radiation to substantially less than a 360° arc outward from the RF applicator. Accordingly, Applicant respectfully submits that claims 20 and 43 recite elements that are not disclosed or suggested by *Kartchner* or *Araya et al.*, considered singly or in combination. Thus, claims 20 and 43 are patentably distinct from *Kartchner* in view of *Araya et al.* Applicant respectfully requests that the rejection of claims 20 and 43 under 35 U.S.C. § 103(a) be withdrawn.

Claims 21-42 and 44-64 further define various features of the invention above the prior art and incorporate all of the limitations recited in claims 20 and 43, from which they respectively depend, either directly or via intervening claims of intermediate scope.

In view of at least the above reasoning, Applicant respectfully requests that the rejection of claims 20-64 under 35 U.S.C. § 103(a) as unpatentable over *Kartchner* in view of *Araya et al.* be withdrawn.

Conclusion

The amendments to the claims presented above are believed to place the application in condition for allowance. Applicant respectfully requests a timely Notice of Allowance.

Respectfully submitted,

for the Applicant
by attorneys,

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